

Implementation of the conjugate gradient algorithm in Lattice QCD on FPGA devices

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We port the most critical part of the Lattice Quantum Chromodynamics code, the iterative solver, to modern FPGA devices. More precisely, we discuss a single-node, double precision implementation of the Conjugate Gradient algorithm and use it to invert numerically the Dirac-Wilson operator on a 4-dimensional grid on a Xilinx Zynq evaluation board. We propose a separation of software/hardware parts in which the entire multiplication by the Dirac operator is performed in hardware, and the rest of the algorithm runs on an ARM core. We find out that the FPGA implementation offers a performance comparable with that obtained modern, general purpose x86 Intel processors. Several directions of further research will be suggested.

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